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ABSTRACT

Christopher Columbus crossed the Atlantic in 1492 and opened a period of extensive exchange between the Old and New Worlds. His greatest impact on the New World has been the one to which the least attention has been paid: his biological impact. For millions of years the biotas of the Old and New Worlds developed independently, divergently. The demographic takeover of North America by large numbers of European humans is but a part of the general invasion of that continent by a portable collection of lifeforms that the explorers, colonists, indentured servants, and slaves brought with them, intentionally or unintentionally. Many plants, especially weeds, took root in the New World and flourished, often crowding out the native flora. Very few plants traveled east to Europe and achieved naturalization there. Native Americans domesticated only the dog and the turkey. Domesticated horses, cattle, pigs, goats, sheep, asses, chickens, cats, and more were brought from the Old World. The efficiency and speed with which they altered their new environment made them superior to any machine ever built. Old world pathogens were the Native Americans' worst enemy. Smallpox, measles, chickenpox, influenza, malaria, yellow fever, diptheria, whooping cough, typhoid fever, scarlet fever, amebic dysentery, and other diseases spread in epidemics that decimated the population. The success of these imported biotas is due to the fact that: (1) they were organisms that thrive in environments of disruption; (2) they came from highly competitive ecosystems and so were hardy; (3) they included many small and invasive organisms; and (4) they were mutually supportive. A 6-item bibliography is included. (JB)

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COLUMBUS AND ECOLOGICAL IMPERIALISM

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COLUMBUS AND ECOLOGICAL IMPERIALISM.

In the United States of America the descendents of Europeans and Africans account for the great majority of the population, Asian Americans for a few percentage points, and the original, the Native Americans (Amerindians or, if you prefer, Indians) for less than one percent, only one and a half million people. The existence of such an enormous majority of people of Old World stock requires some explaining. It is not simply a matter of military conquest, which is a phenomenon common throughout history, but usually without replacement of the conquered people. India is India, despite Kipling. Poland remains Polish, despite all sorts of trampling back and forth by neighbors. Zinbabwe is about as black as it was one hundred or one thousand years ago. But Massachusetts and Connecticut (incidentally, Algonkin words) and Nebraska (an Omaha word) and Mississippi and Alabama and Missouri and Arkansas and Tennessee and Kentucky and Missouri and Iowa and Minnesota and the Dakotas and Kansas and Oklahoma and Utah - all Amerindian words, as are the names of several other states - these lands have majorities of recent immigrants (recent = post-1492) and the offspring of immigrants. How could this be?

Let us consider the United States vis a vis location. The fact that all the states, excepting only the late-comers, Hawaii and Alaska, are located within the temperate zone fails to stimulate much in the way of profound insight. As you would expect, the leaders of the Old World invasion of North America, the Europeans, have proved, like their crops and livestock, their styles of raincoats, the kind of hand lotion they used, etc. to be most successful in lands rather like their home countries in climate.

It is provocative that the United States, while quite a lot like Europe in climate, is remote from Europe. It is not next door; it is on the other side of a deep and ancient ocean. It is a long way from the Old World, and has been so since the halcyon days of the dinosaurs, with the exception of relatively brief (*relatively* brief) periods of contact with Eurasia via the far north whenever ice ages lowered ocean levels sufficiently.

This remoteness of the New World from the Old has been a matter of time, as well as space, and therefore of biological development. Isolation from Eurasia and Africa has meant isolation from important streams of evolution. For millions of years the biotas of the Old and New Worlds developed independently, divergently. The contrast between the biotas of Africa and and South America (a matter, for instance, of the African elephant versus the tapir, South America's biggest quadruped) is much greater than between those of Eurasia and North America, but even in the latter case the difference is impressive and important. Said Peter Kalm, a European naturalist, fresh off the boat in Philadelphia in 1748:

> I found that I was now come into a new world. Whenever I looked to the ground I found everywhere such plants as I had never seen before. When I saw a tree, I was forced to stop and ask those who accompanied me, how it was called....

The divergency of evolution in the Old and New Worlds accelerated when about 10,000 years ago humanity invented civilization (a handy, but admitedly vague term), creating new environments, massively altering ecosystems, intentionally and unintentionally developing new sub-species and, in the case of very short-lived organisms, such as many kinds of microlife, entirely new species. During the last ten millenia the human inhabitants of the strata of the Old World that runs east and west from the Middle Eastern hearthland of civilization increased and rose into the millions earlier than in other areas. These pioneers of Old World civilization created regions of dense population sooner than other people. They intentionally domesticated more species of plants than any other people, with the possible exception of Amerindians, and many more species of animals than any other people, without any exceptions. They hemmed their plants, animals, and themselves into dense concentrations - i.e. fields of barley, pens of goats, and cities of people - inadvertently creating the rich media and ecological disruptions which led to the selection, evolution, and spread of such "weed" species as those plants we specifically call weeds, and, as well, rats, mice, lice, starlings, disease pathogens, etc. Similar "progress," if that is the word, ensued elsewhere, as other peoples followed the Middle Eastern examples, and as Amerindians in Mesoamerica, Peru and environs independently and somewhat later invented their own civilizations.

The biota of civilization is different from the biota of the wilderness. To give a single example, humans as roaming hunters and gatherers are only mildly troubled with large varmints, such as rats, because nomads migrate faster and more continually than rats, but the sedentary people of Old World civilization have had a commensal relationship with rats for thousands of years.

The biotas of humanity's several civilizations are distinctive or, at least, were so until the past few centuries. For instance, the biota of the

England of Captain John Smith included horses and smallpox viruses. The biota of the North America of Pocahontas did not. Such differences can be more significant that the presence or absence of the wheel, gunpowder or the printing press.

The demographic takeover of North America by large numbers of European humans is a part of a general invasion of that continent by a "portmanteau biota," a portable collection of lifeforms that the explorers, colonists, indentured servants, and slaves brought with them, intentionally and unintentionally, and of which the humans were the most articulate, but not always the most important members. To illustrate, let me turn to the eastern third of North America between the Gulf of Mexico and the Hudson Bay. When Europeans first touched the shores of this region (whether Vikings at the turn of the eleventh century or Johnny-come-latelies c. 1500), its biota was significantly different from their homelands'. There were none of the Old World crops, of course, no wheat or barley or turnips or peas, and few of the forage grasses and forbs common in European grasslands. There were few species of pine and no domesticated horses, cattle, sheep, goats, nor house cats; nor any of the Old World's semi-domesticated rats, mice, house sparrows, starlings, or honey bees. Except for the dog, the Amerindians of this part of North America had none of the animals nor, for that matter, and only a few of the pests, body lice, for instance, associated with the Old World's dense poplulations. Nor did they have many of the pathogens associated of the Old World. They did not live in a germless Eden - there were native American diseases - but, say the majority of experts, they did not suffer from smallpox, measles, chickenpox, influenza, malaria, yellow fever, diptheria, whooping cough, typhoid fever, scarlet fever, amebic dysentery, and several other maladies in circulation in the Old World in 1492.

Plants:

Columbus and company were bound to bring more than the benefits of Christianity and double entry bookkeeping to America. Let us take a quick look at the chief components of the Portmanteau Biota as it arrived in North America in this order: plants, animals, pathogens, and finally, people. The first Old World plants to be naturalized in North America probably found a home in Newfoundland, which was visited by European fishermen almost every year from John Cabot's (Giovanni Caboto's) time on. Twenty-three percent of Newfoundland's flora today is European in origin, much of which surely arrived in the ballast dumped by fishing vessels from England, Brittany, Catalonia, and Portugal in colonial times. We can also be sure that the sixteenth century Spanish in Florida and in the abortive settlements in the area of what is now the mid-Atlantic states brought plants with them that went wild, but we cannot be sure of their identity, any more than we

can of those which attained naturalization in Newfoundland. The same must be said of the "weeds" of the first English colonies in Carolina and Virginia. We strike our first vein of certainty with John Josselyn, who visited New England in 1638 and 1663, and left us a list "Of Such Plants as Have Sprung Up since the English Planted and Kept Cattle in New England:" i.e. couch grass, dandelions, shepherd's purse, groundsel, sow thistle, chickweed, etc. Amerindians named one of these, plantain (*Plantago major*) the "Englishman's Foot," because they believed that it would grow only where the English "have trodden, and was never known before the English came into this country."

The champions of the Old World weeds in North America were white clover and what we arrogantly called Kentucky blue grass. Mixed together these were known as English grass in colonial times. They spread widely in the colonies from Nova Scotia to the Carolinas, and when Daniel Boone and his fellow pioneers topped the Appalachians in the last decades of the eighteenth century and descended into the valleys beyond, they found the two waiting for them in Kentucky and Tennessee. The plants had probably entered the west with the French and possibly the Spanish in the late seventeenth and eighteenth centuries. White clover and Kentucky blue grass continued west until the rain petered out on the other side of the Mississippi. They moved west with the domesticated animals, who destroyed the indiginous flora and carried the seeds of the invading flora on their hides and in their bowels. To illustrate:

> Illinois, 1818: Where the little caravans have encamped as they crossed the praries, and have given their cattle hay made of these perennial grasses, there remain ever after a spot of green turf for the instruction and encouragement of future improvers....

In January of 1832 Lewis D. de Sheinitz told the Lyceum of Natural History of New York that the worst weeds in the United States were foreigners, and provided a list of 137 of them. What is called the worst were, simply put, the most successful at healing over the tears in the ground cover made by immigrant farmers and their livestock.

Oddly, very few plants traveled east from Ameica to Europe and achieved naturalization there. Charles Darwin teased America's premier botanist, Asa Gray, on the subject:

> Does it not hurt your Yankee pride that we thrash you so confoundedly? I am sure Mrs. Gray will stick up for your own weeds. Ask her whether they are not more honest, downright good sort of weeds.

She countered effectively, answering that American weeds were "modest, woodland, retiring things; and no match for the intrusive, pretentious, self-asserting foreigners." In this she was perfectly correct. The immigrants

were stripping away the eastern forest, and its minor flora could not survive in the open, especially if subjected to the teeth and hooves of the imported livestock.

Animals:

For almost every purpose - for meat, milk, leather, fiber, power, speed, and even manure - the European domesticated animals were superior to those few species domesticated by Amerindians of either North or South America. The only domesticated animals of the native people of North America were the dog, nearly everywhere, and the turkey in the southwest. The Europeans and Africans disembarked with horses, cattle, pigs, goats, sheep, asses, chickens, cats and more, and members of most of these species set off by themselves to make a zoological revolution. They sought out their own food and were self-replicators, and were, therefore, in the efficiency and speed with which they altered their new environment superior to any machine ever built from that day to this. Swine are omnivorous, and there were more kinds of food available to them in and near the early European settlements in North America (the area north of the Rio Grande) than to any other species of imported animal. They came to the continent no later than 1540 with Hernando de Soto, and were running wild and thriving on the roots and mast of the Gulf coast and hinterland long before Englishmen came ashore at Jamestown or Plymouth. The pigs of Carolina and Virginia, when they went wild a century after De Soto's, especially fancied the fruit of the peach trees, like themselves also imports: "...when they are satiated of the fleshy part, [they] crack the Shells and eat the kernels only." In New England they learned to root for clams, and "they will not faile at low water to be with them." Amerindians despised the pigs because they fouled the clam beds. Swine did well in a great range of environments and weathers, even as far north as France's first successful American colony at Port Royal in Nova Scotia, where they multiplied and often slept out-of-doors in the winter of 1606-7.

After a few generations in the woods, the feral pigs reverted to a type very different from what we are accustomed to seeing in the barnyard. Long-legged, long-snouted, slab-sided, narrow-backed, fast and equipped with long, vicious tusks, they earned the same name in America and Australia - razorback - and provided the frontier people with much of their protein for their first generations overseas. Incidentally, pigs today are no different from yesterday's in their ability to go wild. In 1983 an estimated 5,000 feral pigs were roaming the Cape Kennedy Space Center in Florida, descendents of the tame swine owned by the local residents whose land NASA had bought in the 1960s. "They are mean animals," said Dorn Whitmore of the United States Fish and Wildlife Service. "The leaner and meaner are the best equipped to survive."

Nor until the English and French moved onto the vast grasslands of mid-continental North America in the nineteenth century were the number of their cattle comparable to the herds of New Spain (Mexico), but there were enough of them in the eighteenth to impress Europeans who had never visited Latin America. Shortly after 1700 John Lawson remarked that the stocks of cattle in Carolina were "incredible, being from one to two thousand Head in one Man's Possession...." A Hispanic *hacendado* would have been embarrassed to acknowledge such a paltry herd, but to an Englishman it was huge. Montreal and Boston had their bovine avant-guarde, but the cattle propagated more rapidly in the more southerly latitudes. Within thirty years of the founding of Maryland the settlers were complaining that their stocks of cattle were being "molested by reason of severall heards of wilde Cattle resorting amonge their tame." A couple of human generations later cattle on the South Carolina and Georgia frontier were moving west "under the auspices of cowpen keepers, which move (like unto the antient patriarch or the modern Bedowin in Arabia) from forest to forest as the grass wears out or the planters appear." (We, of course, can made an educated guess as to what replaced the worn out native grasses.)

Amerindian traders and rustlers brought some horses into eastern North America from the praries and plains, but most came directly from Europe and moved westward with the pioneers of the Thirteen Colonies and New France - or even preceeded them. Horses came to Virginia as early as 1620, to Massachusetts in 1629 and to the French settlements in 1665. John Josselyn found plenty of horses in seventeenth century Massachusetts, "and here and there a good one." Their owners let most of them scavenge in the wildnerness for their own feed even in winter, though the practice brought the animals "very low in flesh till the spring, and so crest fallen, that their crests never rise again." He was from Europe where horses were very expensive, and worth taking good care of. In North America they were relatively cheap and wandered free, often with little more evidence of their connection with humanity than collars with a hook at the bottom to catch on fences as they tried to leap over them in order to graze on the crops. Hogs, incidentally, were collared with triangular yokes, so they could not push through fences. Fences were not for keeping livestock in, but for keeping livestock out.

Runty stallions made so much trouble by impregnating valuable mares that statutes were passed requiring their penning or gelding. In Pennsylvania anyone finding a stallion under thirteen hands running free had the legal right to geld him on the spot. Wild horses were a major frontier pest. By 1671 in Maryalnd, for instance, they were mentioned as a serious threat to crops, and at least as early as the turn of the century they were deemed a nuisance on the Virginia frontier. Robert Beverley of that colony recorded that there were many horses in the upland woods

> as shy as any Savage Creature. These having no mark upon them, belong to him, that first takes them. However, the Captor commonly purchases these Horses very dear, by spoiling better in the pursuit, in which case, he has little to make himself amends, besides the pleasures of the Chace. And very often this is all he has for it, for the wild Horses are so swift, that 'tis difficult to catch them: and when they are taken, tis odds but their Grease is melted, or else being old, they are so sullen, that they can't be tam'd.

In sugarless British North America honey was the chief sweetener, and Europeans imported honey bees early. The first arrived in Virginia in the early 1620s, where honey became a common food in the seventeenth century. The bees came ashore in Massachusetts no later than the 1640s, and by 1663 were thriving "exceedingly," according to Josselyn. The immigrant insects achieved naturalization in the seventeenth century and swarmed again and again, moving into the interior faster than their alleged masters. The first honey bees west of the Mississippi are supposed to have settled in Mme. Chouteau's garden in St. Louis in 1792.

Oddly enough, very few of the creatures native to North America have ever gone wild in Europe. The grey squirrel, the muskrat, a few pestiferous insects like the Colorado potato beetle - and then the list trickles to a close.

Pathogens:

The often self-propelled spread of European forage plants and feral animals in North America was crucially important to the spread of the Old World humans, providing them with cheap meat, milk, leather, and power. But it probably would not have been sufficient in and of itself to have enabled them to accomplish a demographic, as well as military, takeover if the Amerindians had been able to survive the onslaught of the Portmanteau Biota in anything like their original numbers - as they should have been able to, one would think. They, after all, were capable of learning how to benefit from the exotic plants and particularly the new animals, and did so in many cases, such as the Sioux with the horse, and the Navaho with sheep. A greater variety of food and access to more power than ever before should have stimulated their population growth. Instead, the indigines' birth rate plunged and death rate soared. Every tribe shrank in numbers initially, and many of them died out completely.

The Amerindians suffered greatly from brutality and alcohol, from the destruction of their game and loss of their farm land, and so on and so on - there is no end to the telling of the suffering of native Americans at the hands of the invaders - but still all this seems insufficient to explain their near extinction. South African Bantu went through much the same

experience, and are today what they were a hundred and two hundred years ago: the great majority of the people living in Africa south of the Tropic of Capricorn.

Evidence of Old World pathogens, the Amerindians' worst enemy, appeared early in the written record of the Americas. In 1493 Columbus landed in Spain with seven Taino Amerindians to show to Ferdinand and Isabella. In less than a year five of the seven were dead from unstated causes. In 1495 Columbus dispatched 550 Amerindian slaves to Spain. Two hundred died on the voyage, and 350 were put to work as field hands. The majority of these soon were dead because, said a contemporary "the land did not suit them." What killed these Amerindians? Spanish brutality? What motive would the Spanish have had in destroying their hard-won mascots and servants? A generation later Jacques Cartier returned from Canada to France with ten Amerindians. In seven years all were dead but one, a young girl. The nine died of disease, and we must suspect that Columbus's Tainos did, too.

The story of the United States begins with Virginia and Massachusetts, and their histories begin with epidemics. At the time of the abortive colony at Roanoke Island in the 1580s the nearby Amerindians

> began to die very fast, and many in short space, in some Townes about twentie, in some fourtie, and in one sixe score, which in trueth was very many in respect of their numbers.... The disease also was so strange, that they neither knewe what it was, nor how to cure it, the like by report of the oldest men in the Countrey never happened before, timne out of minde.

When the Pilgrims settled at Plymouth, Massachusetts, in 1620, they did so at the site of a village and on a coast nearly cleared of Amerindians by a recent epidemic. The thousands who had lived there had, wrote one of the new comers, "died in a great plague not long since: and pity it was and is to see so many goodly fields, and so well seated, without men to dress and manure the same."

It is impossible to list, much less discuss, all the epidemics that decimated the Amerindians. Let us concentrate on one disease, probably the worst and certainly the most spectacular, smallpox. It had long existed in Europe, but had not been among the deadliest killers in the Middle Ages. Then in the sixteenth century it increased in malignancy, and for the next three hundred years was one of Europe's most widespread killers, carrying off a high proportion of every generation's newborn. These three centuries encompassed the entire colonial period for North America.

The first epidemic of smallpox in America flared up in Española at the beginning of 1519 and spread to the mainland, where it was the chief and indispensable ally of the *conquistadores* in Mexico and Peru. The first *recorded* epidemic of the disease in British and French North America

detonated among the Algonkins of Massachusetts in the early 1630s. "Whole towns of them were swept away, in some not so much as one soul escaping Destruction." William Bradford of Plymouth Plantation described just how hard the pox hit the Algonkins, providing details on how the death rates in epidmics among the Amerindians could soar higher, far higher, than the virulency of the malady *per se* would suggest possible. So many were sick at one time, he wrote, that "they were in the end not able to help one another, no not to make a fire nor fetch a little water to drink, nor any to bury the dead." When they ran out of fuel, they burned what was within reach: their trays, dishes, and even their very bows and arrows. Disease can kill not only by overwhelming the immune system, but by overwhelming society, too.

Smallpox raged through New England, on west into the St. Lawrence-Great Lakes region, and from there no one knows how much further. In the 1630s and 1640s the populations of the Iroquois and Huron confederations fell by an estimated fifty percent. Thereafter smallpox never seems to have been active somewhere in the continent nearly every decade until its final eradication in our century. In 1837-38, to cite a particularly awful outbreak, it killed nearly all the Mandans and perhaps half the people of the high plains. Every European people to establish major settlements in North America - the English, French, Dutch, Spanish, and Russian - recorded, sometimes in gloom, sometimes in exultation, the horrors of smallpox running loose among Amerindians who had never known it before.

What imported disease meant for the indiginous people of the New World is neatly expressed in a legend of the Kiows of the southern Great Plains, who suffered at least three and probably four epidemics of smallpox in the nineteenth century. Saynday, the mythic hero of the tribe, comes upon a stranger dressed in a black suit and a tall hat like the Christian missionaries. The stranger speaks first:

"Who are you?"

"I'm Saynday. I'm the Kiowa's Old Uncle Saynday. I'm the one who's always coming along. Who are you?"

"I'm smallpox."

"Where do you come from and what do you do and why are you here?"

"I come from far away, across the Eastern Ocean. I am one with the white men -- they are my people as the Kowas are yours. Sometimes I travel ahead of them, and sometimes I lurk behind. But I am always their companion and you will find me in their camps and in their houses."

"What do you do?"

"I bring death. My breath causes children to wither like young plants in the spring snow. I bring destruction. No matter how beautiful a woman is, once she has looked at me she becomes as ugly as death. And to men I

bring not death alone, but the destruction of their children and the blighting of thir wives. The strongest warriors go down before me. No people who have looked at me will ever be the same."[1]

The invaders took a sunnier view of imported disease. For them smallpox was a nearly endemic infection that afflicted most children, killed many, left the survivors immune, and usually left people of productive maturity alone. John Winthrop, first governor of Massachusetts Bay Colony and a lawyer by training, noted on the 22nd day of May, 1634, "For the natives, they are neere all dead of small Poxe, so as the Lord hathe cleared our title to what we possess."

The New World, in return for smallpox and such, had very little to offer. Chargas's disease and Carrion's Disease are native to the Americas, but have never been important in the Old World, nor even in North America. Venereal syphilis may be American: it was first recognized in Europe shortly after Columbus's return in 1493, but its ultimate origins are a matter of great controversy. Even if we accept it as America's one great contribution to the Old World's pool of infections, it is no match for the list of maladies that crossed the Atlantic in the other direction.

Explanations:

The exchange of pathogens between the Old and New Worlds has been almost entirely one-way, as with the exchange of weeds and animals. No wonder the white Social Darwinists of the nineteenth century thought that actual laws of nature were operating to make Europeans the masters of the earth. They were wrong, of course, but there were certain biogeographical realities - not laws, but realities, all the same - which operated to buoy up European imperialism for a period of generations. European imperialists were riding a tidal wave of biological revolution. Biological divergence had been the rule on the planet for scores of millions of years. Then the Europeans, with their ships and, eventually, planes reversed that, and substituted biological convergency.

Why was the Portmanteau Biota so triumphant in America (and, incidentally, in Argentina, Australia, and New Zealand)? Several general answers come to mind.

One, the portmanteau biota succeeded become it was composed, for the most part, of what we can call weed species, whether they were plant or not. By that I mean organisms that thrive in ephemeralized environments, environments of disruption. For instance, when fire swept the cane brakes of southeastern United States, white clover swept into take over the scorched

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[1]Quoted in abbreviated form from Alice Marriott and Carol Rachlin, *American Indian Mythology* (New York: New American Library, 1968), 174-5.

land faster than any native plant. When Europeans and Africans drove off native carnivores of the same region with musket and poison, the chief beneficiaries were not the indiginous herbivores, but feral pigs, cattle, and horses. When hunger and general stress wore down the resistance of the Amerindians, the infections that took them the rest of the way to their graves were not American, but the "hectic fevers" of the Old World, i.e. respiratory diseases like imported varieties of tuberculosis, whooping cough and influenza.

Two, the portmanteau biota was composed of species from very large ecosystems characterized by a high degree of competition, which produced fecund, tough organisms. For instance, feral Spanish cattle, whose ancestors had survived hundreds of generations being trailed by lions and wolves, found American carnivores not pleasant but tolerable companions. The feral longhorn could outfight or outrun or out-think or certainly out-reproduce any enemy in south Texas, with the sole exception of humans.

Three, the portmanteau biota included many small and invasive organisms - most importantly micro-organisms - that had taken on many of their most significant characteristics in the unique crucible of Old World civilization, where large concentrations of humans and animals - pigs, sheep, chickens, rats, mosquitoes, etc. - lived in intimate contact and in dense concentrations. I speak, for instance, of the pathogens of smallpox, malaria, influenza, measles, rinderpest, and distemper, micro-organisms that first evolved in the special conditions of Old World civilization, with its intermingling crowds of humans and other creatures. Such conditions were very rarely common outside the Old World, and so the Americas lacked many of the Old World diseases or their equivalents. They, for instance, had nothing like the Old World's smallpox, so closely related to and probably of the same origin as cowpox and horsepox. Is it any wonder that Pocahontas fell ill at about twenty years of age and died while on a visit to England, as did at least three of her entourage of nine or ten Algonkins; but that Captain John Smith lived into his fifties, though he traveled widely and exposed himself to the germs of the English, French, Italians, Austrians, Hungarians, Transylvanians, Turks, and Amerindians.

Four, the portmanteau biota was composed of many mutually supportive organisms. The invading livestock destroyed the native American grasses and forbs, opening the way for European grasses and forbs, which in their turn provided durable forage for the livestock. The Europeans and Africans, meanwhile, did all they could to kill off the cougars and wolves, who would otherwise have limited the number of the livestock, preserving the native plants from overgrazing, and preserving the pre-Columbian American ecosystem from irrevocable disruption for another year or two.

In summation, Christopher Columbus crossed the Atlantic in 1492 and opened a period of massive exchanges between the Old and New Worlds. The influence of his voyages on the history of commerce, religion, the nationstate, war, literature - music, too, for all I know - has been immense. But his greatest impact has been the one to which we have paid least attention: his biological impact. Its victims have been many - Passenger Pigeons, Carolina Parrakeets, Wampanoags, Omahas, Modocs, Comanches, and so on. Among its most obvious beneficiaries are the humans who make up the great majority of the population of North America.

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